Reflection Gratings on Con-X

Baseline RGS is like XMM

But there is an attractive alternative

Dates to 1979 work I did that showed reflection gratings could be put in a converging beam.

Natural geometry for grazing incidence is the “off-plane” or “conical diffraction” mount.

Cash, W., “X-ray Optics 2: A Technique for High Resolution Spectroscopy,” *Appl. Opt* , 30, 1749-1759, 1991.

Advantages

- Higher Throughput
- Higher Resolution
- Better Packing Geometry

Disadvantages

- Higher Groove Density

Throughput

- Better Groove Illumination
- Fewer available orders
- Constant Graze Angle

Typically a factor of two

Resolution

$$R = \frac{(\sin\beta - \sin\alpha)\sin\gamma}{B\cos\beta}$$

B is blur in radians

In-plane:

Graze Angle $\theta = \frac{\alpha + \beta}{2}$

So: $R = \frac{2\theta}{B}\left(1 - \frac{\alpha}{\beta}\right) \approx 1.3\frac{\theta}{B}$

At 2 degree graze and 15” resolution
R=600

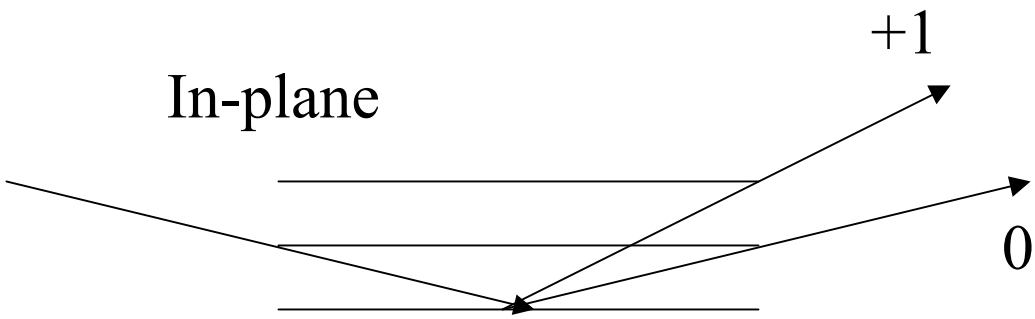
Resolution (cont)

Off-plane

$$R = \frac{2\tan\beta\sin\gamma}{B} \approx \frac{4\theta}{B}$$

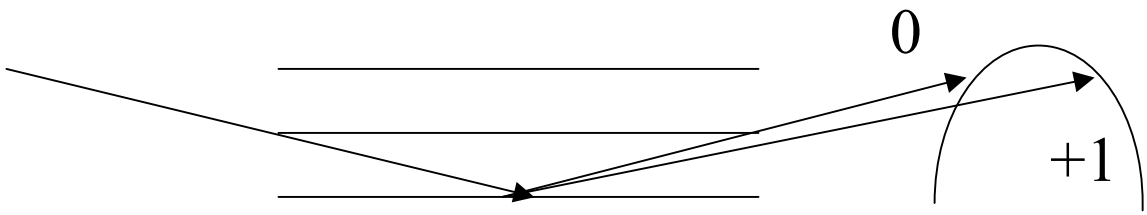
At 2 degrees and 15” resolution
R=1800

Geometry



Central grating must be removed.
Half the light goes through.

Off-plane



Gratings may be packed optimally

For Con-X

Can use the extra capability for:

- Higher resolution
- Higher Collecting Area
- Lighter Gratings
- Even poorer telescopes

Or Some Combination as desired

If the Off-plane mount and its desirable properties are to be available to Con-X it needs better proof.

Main worry is the fabrication of the gratings. High groove density and blaze in a radial configuration.

A program that provides for the fabrication and testing of a single grating would suffice to put the worries to rest.